Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1982 and 1983

1982

Three experiments were made as follows.

I. Winter season, January 26, eggs of *Hemicentrotus pulcherrimus* were used, see Table 1.

II. Spring season, an experiment was made in May 24, using *Anthocidaris crassispina* eggs, see Table 2.

III. Autumn season, September 6, eggs of *Anthocidaris crassispina* were used, see Publ. Seto Mar. Biol. Lab., Vol. 30, No. 4/6, pp. 220–221, Table 5, 1985.

(Notes common to all tables: Fertilization membrane formation examined 3 min. after fertilization; minutes and hours in parentheses respectively after First cleavage, Gastrulation and Pluteus indicate the time after insemination; the maturation state of gonads used was nearly ripe to full ripe; For the 0 min. old sperms and 3.5–6 hrs. old eggs, Degree of inhibitory effect 0 show the non-inhibtiion, 1 the slight inhibition, 2 the weak, 3 the moderate, 4 the strong and 5 the violent inhibition state of the sea water tested (see Ranking II, Publ. Seto Mar. Biol. Lab., Vol. XXI, No. 5/6, p. 391, Table 8, 1974); For the 5 mins. old sperms and 3.5–6 hrs. old eggs, Degree of inhibitory effect see the above and Ranking III, Publ. Seto Mar. Biol. Lab., Vol. 30, No. 4/6, p. 224, Table 6, 1985.

1983

Four experiments were made as follows.

I. Winter season, February 2, eggs of *Hemicentrotus pulcherrimus* were used, see Table 3.

II. Spring season, an experiment was made in May 13, using *Anthocidaris crassispina* eggs, see Table 4.

III. Summer season, July 24, eggs of *Anthocidaris crassisispina* were used, see Table 5.

IV. Autumn season, an experiment was made in September 12, using *Anthocidaris crassispina* eggs, see Table 6.

(Notes common to all tables: See the notes mentioned above.)

Naomasa Kobayashi

Biological Laboratory
Doshisha University
Kyoto, 602, Japan

Publ. Seto Mar. Biol. Lab., 30 (4/6), 333–338, 1985. (Biological Data 2)

Table 1. Results of the Jan. 26, '82 experiment with eggs of *Hemicentrotus pulcherrimus*.

Wind: 0. Test water temperature: 19°C. 0 mins. old sperms. 6 hrs. old eggs. *After Ranking II 1974

Location (depth)	Fertiliz. membrane formation	First cleavage (90 min.) 1 cell	2 cell (normal)	multi-cell (polyspermy)	Gastrulation (20 hrs.) permanent blastula	gastrula (normal)	exogastrula	*Degree of inhibitory effect
(m)	%	%	%	%	%	%	%	
Running	99.5	0.5	99.5	0	1.0	99.0	0	
sea water of	98.0	2.5	97.5	0	2.0	98.0	0	0
Laboratory	97.5	3.0	97.0	0	1.0	99.0	0	
Water from	95.0	6.0	94.0	0	4.0	96.0	0	development
land side of	94.0	7.0	93.0	0	5.5	94.5	0	3 somewhat
Hatakejima	95.0	5.0	95.0	0	5.0	95.0	0	delayed
Surface	96.0	5.0	95.0	0	2.5	97.5	0	
Bottom (7)	97.5	3.0	97.0	0	4.0	96.0	0	0
	95.5	4.5	95.5	0	3.0	97.0	0	
Sea water from	96.5	4.0	96.0	0	2.0	98.0	0	
Tsunashirazu	97.5	2.5	97.5	0	2.5	97.5	0	1
cove	97.5	3.0	97.0	0	4.5	95.5	0	
Surface	95.0	5.0	95.0	0	2.5	97.5	0	
Bottom (5)	96.0	4.5	95.5	0	3.0	97.0	0	0
	96.0	4.0	96.0	0	3.5	96.5	0	

5 mins. old sperms. 6 hrs. old eggs. *After Improved ranking (Ranking III)

Location (depth)	Fertiliz. membrane formation	First cleavage (90 min.) 1 cell	2 cell (normal)	multi-cell (polyspermy)	Gastrulation (20 hrs.) permanent blastula	gastrula (normal)	exogastrula	Pluteus (36 hrs.) abnormal pluteus	normal pluteus	*Degree of inhibitory effect
(m)	%	%	%	%	%	%	%	%	%	
Running	100	1.0	99.0	0	2.0	98.0	0	2.5	97.5	
sea water of	96.5	3.5	96.5	0	1.5	98.5	0	2.0	98.0	0
Laboratory	97.0	4.0	96.0	0	2.5	97.5	0	4.0	96.0	
Water from	95.0	7.0	93.0	0	4.0	96.0	0	11.0	89.0	development
land side of	92.5	8.5	91.5	0	6.0	94.0	0	10.0	90.0	3 somewhat
Hatakejima	94.5	6.5	93.5	0	5.5	94.5	0	13.5	86.5	delayed
Surface	95.0	5.5	94.5	0	3.0	97.0	0	4.5	95.5	
Bottom (7)	97.0	4.0	96.0	0	4.5	95.5	0	6.0	94.0	1
	94.0	6.5	93.5	0	2.5	97.5	0	5.5	94.5	
Sea water from	96.5	4.0	96.0	0	3.5	96.5	0	5.5	94.5	
Tsunashirazu	97.0	3.5	96.5	0	2.5	97.5	0	5.0	95.0	1
cove	95.0	6.0	94.0	0	4.5	95.5	0	6.5	93.5	
Surface	96.5	4.5	95.5	0	3.5	96.5	0	6.5	93.5	
Bottom (5)	93.5	6.5	93.5	0	2.0	98.0	0	4.0	96.0	1
	95.5	5.0	95.0	0	3.5	96.5	0	7.5	92.5	

Table 2. Results of the May 24, '82 experiment with eggs of *Anthocidaris crassispina*.

Wind: 0. Test water temperature: 24°C. 0 mins. old sperms. 3.5 hrs. old eggs. *After Ranking II 1974

Location (depth)	Fertiliz. membrane formation	First cleavage (60 min.) 1 cell	2 cell (normal)	multi-cell (polyspermy)	Gastrulation (18 hrs.) permanent blastula	gastrula (normal)	exogastrula	*Degree of inhibitory effect
(m)	%	%	%	%	%	%	%	
Running	99.0	0.5	99.0	0.5	2.0	98.0	0	
sea water of	99.5	1.0	99.0	0	1.5	98.5	0	0
Laboratory	99.0	1.0	99.0	0	1.0	99.0	0	
Water from open	99.5	2.0	97.0	1.0	1.5	98.5	0	
sea side of Hata-	98.0	1.0	97.5	1.5	2.0	98.0	0	0
kejima Surface	99.0	1.5	98.0	0.5	1.5	98.5	0	
Water from	98.5	1.0	97.5	1.5	2.5	97.5	0	
land side of	99.0	1.5	98.0	0.5	4.0	96.0	0	1
Hatakejima	98.5	2.0	97.0	1.0	5.0	95.0	0	
Surface	97.5	3.0	92.5	4.5	91.5	8.5	0	
Bottom (7)	93.5	7.0	91.5	1.5	89.0	11.0	0	5 development delayed
	97.0	4.0	95.0	1.0	85.5	14.5	0	
Sea water from	96.5	1.0	95.0	4.0	5.0	95.0	0	
Tsunashirazu	96.0	3.0	95.0	2.0	6.5	93.5	0	1
cove Surface	97.5	3.0	94.5	2.5	3.5	96.5	0	

5 mins. old sperms. 3.5 hrs. old eggs. *After Improved ranking (Ranking III)

Location (depth)	Fertiliz. membrane formation	First cleavage (60 min.) 1 cell	2 cell (normal)	multi-cell (polyspermy)	Gastrulation (18 hrs.) permanent blatsula	gastrula (normal)	exogastrula	Pluteus (34 hrs.) abnormal pluteus	normal pluteus	*Degree of inhibitory effect
(m)	%	%	%	%	%	%	%	%	%	
Running	99.5	1.0	97.5	1.5	4.0	96.0	0	2.0	98.0	
sea water of	99.0	1.0	99.0	0	2.5	97.5	0	3.5	96.5	0
Laboratory	98.5	1.5	98.5	0	2.5	97.5	0	4.5	95.5	
Water from open	99.0	1.0	97.5	1.5	4.5	95.5	0	3.5	96.5	
sea side of Hata-	98.5	2.0	96.0	2.0	4.0	96.0	0	5.0	95.0	1
kejima Surface	99.5	1.0	99.0	0	3.0	97.0	0	3.0	97.0	
Water from	99.5	1.0	97.0	2.0	5.0	95.0	0	5.0	95.0	
land side of	99.0	1.5	92.0	6.5	6.5	93.0	0.5	6.5	93.5	2
Hatakejima	99.0	1.0	98.0	1.0	5.5	94.5	0	5.5	94.5	
Surface	99.0	1.5	93.0	5.5	98.0	2.0	0	83.5	16.5	
Bottom (7)	97.5	2.5	95.0	2.5	91.0	8.5	0.5	100	0	5 development delayed
	98.5	2.0	96.5	1.5	93.0	7.0	0	100	0	
Sea water from	98.5	1.0	94.5	4.5	6.0	94.0	0	16.5	83.5	development
Tsunashirazu	97.0	3.0	91.0	6.0	11.0	89.0	0	21.0	79.0	4 somewhat
cove Surface	98.0	2.0	95.5	2.5	7.5	92.5	0	15.0	85.0	delayed

Table 3. Results of the Feb. 2, '83 experiment with eggs of *Hemicentrotus pulcherrimus*.

Wind: 0. Test water temperature: 19°C. 5 mins. old sperms. 6 hrs. old eggs. *After Ranking III

Location (depth)	Fertiliz. membrane formation	First cleavage (90 min.) 1 cell	2 cell (normal)	multi-cell (polyspermy)	Gastrulation (20 hrs.) permanent blastula	gastrula (normal)	exogastrula	Pluteus (36 hrs.) abnormal pluteus	normal pluteus	*Degree of inhibitory effect
(m)	%	%	%	%	%	%	%	%	%	
Running	94.5	6.0	94.0	0	0	100	0	1.5	98.5	
sea water of	95.0	6.5	93.5	0	0	100	0	1.0	99.0	0
Laboratory	96.5	4.0	95.5	0.5	0.5	99.5	0	1.0	99.0	
Water from	93.0	8.5	89.0	2.5	0.5	99.5	0	2.0	98.0	
land side of	92.0	9.0	90.0	1.0	0.5	99.5	0	1.0	99.0	1
Hatakejima	94.0	6.5	92.0	1.5	1.0	99.0	0	1.5	98.5	
Surface	93.0	6.5	92.5	1.0	3.5	96.5	0	2.5	97.5	
Bottom (7)	90.5	10.0	88.0	2.0	1.0	99.0	0	3.5	96.5	1
	91.0	9.5	89.0	1.5	2.5	97.5	0	4.0	96.0	
Sea water from	94.5	7.0	92.0	1.0	2.0	98.0	0	3.0	97.0	
Tsunashirazu	91.5	8.5	90.5	1.0	2.0	98.0	0	3.0	97.0	1
cove	90.0	11.0	87.0	2.0	1.5	98.5	0	3.0	97.0	
Surface	81.5	24.5	74.5	1.0	4.0	96.0	0	14.0	86.0	
Bottom (5)	88.0	13.0	86.0	1.0	2.5	97.5	0	13.5	86.5	2
	84.5	17.0	81.0	2.0	5.0	95.0	0	13.0	87.0	

Table 4. Results of the May 13, '83 experiment with eggs of *Anthocidaris crassispina*.

Wind: 0. Test water temperature: 25°C. 5 mins. old sperms. 3.5 hrs. old eggs. *After Ranking III

Location (depth)	Fertiliz. membrane formation	First cleavage (55 min.) 1 cell	2 cell (normal)	multi-cell (polyspermy)	Gastrulation (17 hrs.) permanent blastula	gastrula (normal)	exogastrula	Pluteus (33 hrs.) abnormal pluteus	normal pluteus	*Degree of inhibitory effect
(m)	%	%	%	%	%	%	%	%	%	
Running	99.0	1.5	98.5	0	2.0	98.0	0	0.5	99.5	
sea water of	98.0	3.0	97.0	0	1.0	99.0	0	1.5	98.5	0
Laboratory	97.0	3.5	96.5	0	1.5	98.5	0	1.0	99.0	
Water from	95.0	6.0	94.0	0	3.0	97.0	0	1.0	99.0	
open sea side	97.5	3.0	97.0	0	2.0	98.0	0	2.0	98.0	0
of Hatakejima	96.0	5.0	95.0	0	2.5	97.5	0	1.5	98.5	
Surface										
Water from land	97.5	2.5	97.5	0	1.5	98.5	0	0.5	99.5	
side of Hatake-	98.0	3.0	97.0	0	2.5	97.5	0	2.0	98.0	0
jima Surface	96.5	3.5	96.5	0	1.5	98.5	0	1.0	99.0	
Sea water from	78.5	23.0	77.0	0	4.0	96.0	0	2.0	98.0	
Tsunashirazu	83.0	20.0	80.0	0	5.5	94.5	0	4.5	95.5	2
cove Surface	86.0	15.5	94.5	0	3.5	96.5	0	3.5	96.5	

Table 5. Results of the July 24, '83 experiment with eggs of *Anthocidaris crassispina*.

Wind: 0. Test water temperature: 28°C. 5 mins. old sperms. 3 hrs. old eggs. *After Ranking III

Location (depth)	Fertiliz.	First cleavage (50 min.)			Gastrulation (15 hrs.)			Pluteus (26 hrs.)		*Degree of inhibitory effect
	membrane formation	1 cell	2 cell (normal)	multi-cell (polypsermy)	permanent blastula	gastrula (normal)	exogastrula	abnormal pluteus	normal pluteus	
(m)	%	%	%	%	%	%	%	%	%	
Running sea water of Laboratory	98.0	2.5	97.5	0	1.5	98.5	0	1.0	99.0	
	99.0	2.0	98.0	0	1.0	99.0	0	1.5	98.5	0
	97.0	4.0	96.0	0	2.0	98.0	0	2.0	98.0	
Water from open sea side of Hatakejima Surface	98.5	3.0	97.0	0	1.0	99.0	0	0.5	90.5	
	99.5	1.5	98.5	0	0.5	99.5	0	1.0	99.0	0
	96.0	4.5	95.5	0	1.0	99.0	0	1.5	98.5	
	96.0	5.5	94.5	0	1.5	98.5	0	2.0	98.0	
Bottom (25)	94.0	6.0	93.0	1.0	2.5	97.5	0	1.5	98.5	0
	95.0	7.5	91.0	1.5	2.5	97.5	0	2.0	98.0	
Water from land side of Hatakejima Surface	92.0	9.0	91.0	0	2.0	98.0	0	3.0	97.0	
	93.5	7.0	92.5	0.5	2.5	97.5	0	4.5	95.5	1
	89.0	12.0	87.5	0.5	3.0	97.0	0	6.0	94.0	
	89.0	12.0	86.0	2.0	2.0	98.0	0	4.5	95.5	
Bottom (27)	86.0	11.0	85.5	3.5	1.5	98.5	0	7.0	93.0	2
	87.0	15.0	80.0	5.0	2.0	98.0	0	6.5	93.5	
Sea water from Tsunashirazu cove Surface	91.0	10.0	89.0	1.0	3.0	97.0	0	6.0	94.0	
	93.5	7.5	92.0	0.5	2.5	97.5	0	5.5	94.5	1
	88.0	12.0	87.0	1.0	3.0	97.0	0	7.5	92.5	
	90.5	10.0	87.0	3.0	2.5	97.5	0	7.0	93.0	
Bottom (5)	87.0	13.5	82.0	4.5	2.0	98.0	0	6.5	93.5	2
	88.5	16.0	82.0	2.0	3.0	97.0	0	8.0	92.0	

Table 6. Results of the Sept. 12, '83 experiment with eggs of *Anthocidaris crassispina*.

Wind: SW1. Test water temperature: 27°C. 5 mins. old sperms. 3 hrs. old eggs. *After Ranking III

Location (depth)	Fertiliz. membrane formation	First cleavage (50 min.) 1 cell	2 cell (normal)	multi-cell (polyspermy)	Gastrulation (15 hrs.) premanent blastula	gastrula (normal)	exogastrula	Pluteus (26 hrs.) abnormal pluteus	normal pluteus	*Degree of inhibitory effect
(m)	%	%	%	%	%	%	%	%	%	
Running sea water of Laboratory	99.5	1.0	99.0	0	0	100	0	0.5	99.5	
	99.0	1.5	98.5	0	1.5	98.5	0	1.0	99.0	0
	99.5	0.5	98.5	1.0	1.0	99.0	0	1.0	99.0	
Water from open sea side of Hatakejima Surface	99.0	1.0	99.0	0	0.5	99.5	0	1.5	98.5	
	99.5	0.5	99.5	0	1.0	99.0	0	1.0	99.0	0
	99.5	0.5	99.0	0.5	1.5	98.5	0	1.5	98.5	
Water from land side of Hatakejima Surface	96.5	1.5	80.0	18.5	7.5	92.5	0	13.5	86.5	
	95.0	2.0	82.5	15.5	9.5	90.5	0	11.0	89.0	5
	94.0	3.5	85.0	11.5	10.0	90.0	0	8.5	91.5	
	93.0	27.0	69.5	3.5	12.5	87.5	0	11.5	88.5	
Bottom (27)	94.5	21.5	77.0	1.5	9.0	91.0	0	2.5	97.5	2
	95.0	18.5	77.0	4.5	11.5	88.5	0	7.0	93.0	
Sea water from Tsunashirazu cove Surface	97.0	10.5	83.0	6.5	9.5	90.5	0	5.5	94.5	
	96.0	8.5	86.5	5.0	8.0	92.0	0	7.5	92.5	2
	95.0	10.0	86.5	3.5	10.5	89.5	0	6.0	94.0	
	94.5	25.5	71.5	3.0	13.5	86.5	0	4.5	95.5	
Bottom (5)	95.5	18.5	80.5	1.0	10.5	89.5	0	3.0	97.0	2
	91.5	21.0	75.0	4.0	9.5	90.5	0	5.5	94.5	